

Frequently Asked Questions

April 28, 2006 Armin Doerry

Q What does Sandia gain by making these images available on the web?

A Sandia designs and builds high-performance real-time Synthetic Aperture Radar (SAR) systems. We are eager for researchers to exploit our images and help foster a demand for what we do.

Q Why aren't these images classified or otherwise limited in their availability?

A Our classification guidance is that when based on resolution alone, we can treat as unclassified and unlimited release our R&D images down to as fine as 0.1 m (slant-range and azimuth).

Q If I want to use these images in my research and perhaps a publication, what permissions do I have?

A We generally allow using our images in publications as long as there is attribution to Sandia National Laboratories (presuming, of course, that you have good things to say about them). We aren't particularly interested in signing a bunch of release forms, though.

Q Why are there only a limited number of images available? Do you have a larger database of images?

A Our goal at this time is to put forth merely a limited sampling of the large stock of images we have available. This is to whet your appetite for more.

Q Why do these images come only in the Sandia GFF format?

A Sandia's GFF format was developed to facilitate our own engineering analysis of our system's images. As such, it has become our internal standard output format.

Q Do you have tools other than Matlab software to read this data?

A Not that we can supply at this time. Matlab™ (available from The MathWorks¹) is a widely used, and very excellent image analysis tool here at Sandia.

Q Can I get these images in other formats? say NITF?

A Not from us, at least for the time being.

Q Can we get more images?

A Possibly, but probably not for free.

Q Are data at other frequencies available? Say, X-band or Ka-band?

A Sandia does have data at other frequencies, and we expect to put some of these on the web at some point, when we can get to it. Keep checking back to see.

Q Can I get images at other resolutions? finer resolutions?

A The complex images can be filtered to yield coarser resolutions. We are limited from providing images in this manner at finer resolutions. If you are eligible for receiving Official Use Only data, then call us.

Q Can we get the raw phase-history data for these images?

A Not at this time. You can always go back to the frequency domain from the image domain to get pseudo-phase-history data.

Q Is the auxiliary data (metadata) correct?

A Mostly, but not always. This data comes with no warranty.

Q What image formation algorithm was employed to form these, and what details can you share about the image formation process?

A These images were formed using Polar Format processing. Insight into the algorithms that were employed can be found in Reference 2.

Q What window function was used in processing this data?

A This data was processed using a -35 dB Taylor window ($nbar = 4$).

Q Were these images autofocused? What algorithm was used?

A These images were autofocused using the Phase-Gradient Autofocus (PGA) algorithm.³

Q Why are some of the images darker at one side?

A This is the result of inadequate antenna pointing accuracy in our early MiniSAR engineering test flights, from which this data was acquired. This can be removed by the technique described in Reference 4.

Q Why are these images so grainy?

A This is due to fully developed speckle. These images have not been multi-looked or equivalent. The images include phase data for each pixel.

Q Why are the shadows always pointing in the same direction?

A The radar provides its own illumination. The shadows that you see are locations that are obscured or occluded from the radar. These are not sun shadows. The shadows are in directions away from the radar. If the bottom of the image is at near range, then the shadows will point up. Sometimes we turn the images upside-down (with near range at the top) to accommodate the natural geometric distortions in the image and make them look more intuitive. In this case the shadows will point down.

Q What are the reflective lines across the images?

A Lines and smearing in the azimuth direction may be due to any of a number of sources. There may in fact be an azimuth-aligned structure such as utility lines.

More likely they are objects moving in the image with their Doppler shifted and smeared.

Q How can I tell what the height of the objects are, everything looks to be the same height?

A A single SAR image is a 2-D projection, just like any other image. Object height can nevertheless be measured using a variety of techniques, including its layover characteristics, or perhaps its shadow length. A 3-D location for a pixel requires more exotic processing such as Stereo-SAR, or Interferometric SAR (InSAR or IFSAR).

Q It looks like the image is smeared at one point, is that wind?

A Moving objects will be displaced in azimuth and normally smeared as well. This is often evident in the returns from trees on a windy day.

Q Some of the images look like there are tire tracks, is that what I am seeing?

A Probably yes. Ruts in dirt roads or across fields are readily observable in fine resolution images such as these. Even areas on asphalt that have been smoothed from traffic are often observable. Mower tracks on grass are also often seen.

Q Can I get custom data collected of my own targets or target scenes?

A Yes, but probably not for free. If you are willing to pay for this, then call us.

Q Whom do we contact for more images or data?

A Please see the contacts page of our web site.⁵

References

- ¹ <http://www.mathworks.com/>
- ² Grant D. Martin, Armin W. Doerry, “SAR Polar Format Implementation with MATLAB”, Sandia Report SAND2005-7413, Unlimited Release, November 2005.
- ³ D. E. Wahl, P. H. Eichel, D. C. Ghiglia, C. V. Jakowatz Jr., “Phase Gradient Autofocus – A Robust Tool for High Resolution SAR Phase Correction”, *IEEE Transactions on Aerospace and Electronic Systems*, Vol. 30, No. 3, pp.827-834, July, 1994.
- ⁴ Armin W. Doerry, “Automatic Compensation of Antenna Beam Roll-off in SAR Images”, Sandia Report SAND2006-2632, Unlimited Release, April 2006.
- ⁵ <http://www.sandia.gov/radar/contacts.html>